of experimental psychology to educational problems. Seeing that it is the first serious treatise on the subject which has yet appeared, such a pioneer work naturally deserves warm welcome and temperate criticism, even though there be important points of detail, both in the methods employed and in the conclusions drawn, which can hardly be accepted without reservation. As Prof. Thorndike ably points out in the last five pages of his book, there are numerous problems and experiments described by him which any trained teacher "can attack with a fair promise of success." His obvious aim in publishing this work at the present primitive stage of genetic psychology is to encourage a greater number of workers in the field of research with which he has so closely identified himself in the United States. For this reason, doubtless, he has omitted all consideration of the comparative data already available in other countries than his own.

The first two chapters are devoted to the methods of measurement and to the statistical distribution of mental traits within the community. The view is upheld that "the distribution of any mental trait in a homogeneous species undisturbed by selection is that given by the probability integral." It is to be regretted that the author has not devoted more space to statistical methods. Such sentences as the following, on p. 20, are surely unwise:—"The mathematical formulæ by which this is done need not concern us here." "Here again the mathematical formulæ are best omitted. The reader may take it on trust that such a transposition as the following is correct."

The third chapter concerns the correlation between different mental abilities in the same individual. An endeavour is made to define the certainty with which any scholar who is especially proficient in one subject of study will surpass or fail to reach the average in other subjects. It is experimentally shown that the phrase "ability in arithmetic" is "but an abstract name for a number of partially independent abilities."

The remaining chapters are concerned with experimental work upon the connection of mental traits with sex and age, upon the relation between mental and physical traits, and upon the influence of heredity and environment. Within the limits of this notice it is impossible even to summarise the many highly interesting results of the experiments of the author and his countrymen. As the author observes,

> "The science of education when it developes will like other sciences rest upon direct observations of and experiments on the influence of educational institutions and methods made and reported with quantitative precision. . . . It is the vice or the misfortune of thinkers about education to have chosen the methods of philosophy or of popular thought instead of those of science. We ruminate over the ideas of Pestalozzi or Herbart or Froebel as if writing a book a hundred years ago proved a man inspired. . . . We are like chemists who should quarrel over the views of Paracelsus or Arnauld of Villeneuve. . . . In education everything is said but nothing proved" (p. 164).

This book is a worthy and welcome attempt to apply exact method to educational problems, although it leaves some little to be desired in style and general appearance.

CHARLES S. MYERS.

OUR BOOK SHELF.

Précis d'Électricité Médicale, Technique Électrophysiologie, Électrodiagnostic Électrothérapie, Radiologie, Photothérapie. By Prof. E. Castex. Pp. vii + 672; 208 figures. (Paris: F. R. de Rudeval, 1903.)

THE object of the author has been to furnish the medical student with a work which will be useful to him in the present state of electrical knowledge, but the author hopes that it will also not be without value to medical men who are devoting themselves to the special study of electrotherapeutics, and likewise to practitioners who have not had such opportunities.

The work is divided into five different sections, including technique, electrophysiology, electrodiagnosis, electrotherapy, and lastly the study of X- and other rays.

The author has been very successful in the arrangement of his matter, and the physical aspect of the question has not been neglected, judging, of course, from the medical point of view. The various currents employed in medicine, continuous, interrupted, sinusoidal, high-frequency, and static, have all been practically and efficiently explained. The second and third chapters, dealing with electrophysiology and diagnosis, will be found particularly useful to those who desire a practical and not too exhaustive guide. The application of electricity to the diseases of the different organs is described in concise and practical terms, a fact which will be useful to physicians who have not had the advantages of modern training at one of the electric departments which now form a part of most large hospitals. The last chapter, which is devoted to X-rays, occupies something like 120 pages, and cannot, of course, be expected to compete with the larger treatises, such as Bouchard's, recently published. But again Prof. Castex has shown his practical tendency by giving under each heading a short and very useful guide to the interpretation of photographic as well as radioscopic diagnosis, and radiotherapy itself, although briefly treated, has not been forgotten.

The work contains about 208 illustrations, well chosen to assist the student in understanding the theories, instruments, and clinical charts.

A careful perusal of the work will show that it has been written by one who understands his subject and the needs of the student and practitioner. It is concise, thoroughly practical, and just such a guide as should appeal to those for whom the author has written the work.

J. M.

Radium and All About It. By S. Bottone. Pp. 96; with four figures and four full-page plates. (London: Whittaker and Co., 1904.) Price 1*s*. net.

THE appearance of a popular shilling volume dealing with the properties of the salts of radium and the theory of radio-activity may be regarded as an indication of the wide interest that has been aroused by the discovery and investigation of the radio-active elements. There is much to be said in favour of the production of a book that shall satisfy the curiosity of those whose interest has been aroused but whose knowledge of chemistry and physics is insufficient to enable them to follow the developments of the subject in the technical journals. In spite of its rainbow-tinted cover and its somewhat boastful title, the present volume gives a substantially accurate account of the most important phenomena. It contains liberal quotations from the chief workers in the subject, though these are taken chiefly from articles that have appeared in the non-technical journals and reviews. The author appears to have derived his information almost entirely

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from English sources, and to have devoted more attention to popular expositions than to the original literature of the subject. The volume is consequently not free from the faults that are almost inseparable from a compilation of this kind, and the arrangement of the matter is in places somewhat confusing. But the author has made a sober and honest attempt to give a simple explanation of a very complex subject, and has attained a fair measure of success. The figures are clearly and simply drawn, and the full-page plates, which include reproductions of the spectra of radium, calcium and helium, and of Sir William Huggins's two series of spectra, are valuable features of the book.

Second Stage Botany. By J. M. Lowson. Pp. viii+452. (London: W. B. Clive, 1904.) Price 3*s.* 6*d.*

THE syllabus of the second stage examination in botany of the Board of Education has been judiciously framed on broad lines, and those students generally shape best who possess a reasonable knowledge of the structure and activities of plants and apply that knowledge in their answers. In the preparation of students for this examination the primary object should be to emphasise leading principles, and further to stimulate reflection by making the student observe many facts for himself. Instead of this one finds in the book under notice the usual attempt to supply directly all the information required to answer the manifold questions which are possible, and important facts are lost in the mass of detail. In the latter part of chapter ii., which deals with tissues, the most essential fact is the importance of the vascular tissues as continuous conductive strands, but this is relegated to one of the final sections, which is reached after wading through descriptions of meristems, stereid bundles, sclerotic cells, &c. The chapter on the leaf bristles with terms, including the "incubus" of phyllotaxis, but any suggestions as to the reasons for the variety of form are considered unnecessary. Another defect in the book is the inclusion of antiquated terms and ideas, of which the most noticeable, because it is accompanied by a diagram (Fig. 105), is the existence of centrospheres in Phanerogams. The description of "double-fertilisation" is peculiar; on p. 199 it is stated that the generative cells pass down into the pollen tube, and one cell fuses with the oosphere; "the fate of the other generative cell is described on p. 304." One is tempted to find a correlation between this method of incorporating the result of recent research and the statement which appears in the introduction, that a large portion of this work has already appeared in the author's "Text-book of Botany."

Les Frontières de la Maladie. Maladies latentes et Maladies atteruées. By Dr. J. Héricourt. Pp. xi+285. (Paris: Ernest Flammarion, 1904.) Price 3.50 francs.

ALTHOUGH in well marked cases health and sickness are distinct and opposite conditions, in a large number of instances the boundary between the two is indefinite, the one passing insensibly into the other, and it is with this borderland that the author of the work under review deals. Commencing with dyspepsia, he shows how this may pass on into more grave conditions, and by natural stages finally comes to consider the mild types of such infective diseases as scarlatina, enteric fever, and diphtheria, which in their mildest forms cause little disturbance, and may pass unnoticed and undiagnosed.

Among others, an interesting chapter is devoted to a consideration of how epidemics of disease spontaneously die out. As treating of a little studied branch of medicine, the book is suggestive and to be recommended. R. T. HEWLETT.

LETTERS TO THE EDITOR.

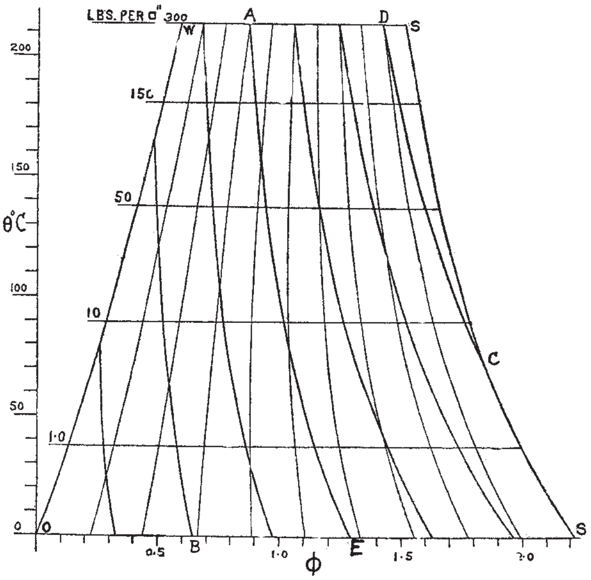
The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE *No notice is taken of anonymous communications.*]

$\theta\phi$ Lines of Total Heat.

I THINK that $\theta\phi$ diagram curves showing constant total heat, although often drawn by students, have never yet been published, and I venture to ask you to publish a set made more carefully than usual by one of my students, Mr. A. W. Steed. Total heat is intrinsic energy $+ pv$, so that for steam it is what Regnault called his total heat. In the figure I have indicated the pressure, but of course the ordinate is proportional to temperature and the abscissa is entropy. Along OW the stuff is all water. Along SS the stuff is all saturated steam. The thin lines, like AB, show the stuff maintaining the same fractional dryness; for example, along AB the stuff is 0·3 of steam, 0·7 of water. Along the thicker lines, like AE, the stuff has constant total heat.

Many people have the notion that when steam is throttled it is very greatly dried. Of course the drying is greater if the place of throttling is well protected from loss of heat by a non-conducting covering, and in this case total heat remains constant. Now if the line DC is looked at, it will be seen that steam which is 90 per cent. dry at 300 lb. pressure, if throttled to 150 lb. pressure is about 93 per cent. dry, and if throttled to 50 lb. pressure is about $95\frac{1}{2}$ per cent. dry. Thus the drying effect is not very great.

LINES OF CONSTANT TOTAL HEAT "H"



The effect is evidently more marked with very wet steam. Thus, looking at AE, steam 30 per cent. dry at 300 lb. pressure becomes 42 per cent. dry if throttled to 50 lb.

The lines show at once how much steam at any pressure will result on the Halpin system of storage from each pound of stored hot water. Thus imagine a total heat line from the point W in the figure. A pound of water stored at 300 lb. pressure and reduced to 150 lb. pressure will generate about 0·07 lb. of steam.

I need not mention the other important applications of this diagram. To the right of SS, in the superheated part, lines of constant total heat are horizontal, being lines of constant temperature. JOHN PERRY.

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